possibility if it existed; but it would be much more easy, if the squamosal suture with the parietal bone had become obliterated, and the specimens studied were few, to suppose that the difficulty could be so explained. The existence of that suture, which is usually well seen, would restore to all the bones of the upper part of the head their usual names; and in view of the large serpent-like development of the parietals in *Ichthyosaurus*, it is not easy to bring one's self to call them squamosals if any other explanation can be given. There would then (excepting also the loss of the supraquadrate bone) be nothing to distinguish the *Ichthyosaurus* under discussion from other Ichthyosaurs but the anomalous little bones at the back of the nostril, which could neither be nasal nor any named element of the skull. Than that a new bone should appear in such a place it would seem less improbable that the obscure element should be an accidental dismemberment of an adjacent bone—probably a part of the lachrymal, which usually extends over the area which the supposed new bone occupies. The lachrymal is often fractured, even in crania which have preserved their natural form.

Prof. Cope's nomenclature of the bones of the lower jaw does not accord with the structures of any Ichthyosaur known to me. The articular bone is not a long external splint element, as shown in his figure, but is shaped more like the hoof of an odd-hoofed mammal, and is usually so enclosed in the jaw as only to display its articular surface, and is never seen in a view of the external part of the jaw.

There are many points in the Ichthyosauria worthy of attention; and on the relation of the immature to the adult animal I trust soon to be able to offer some new evidence.

XXXV.—*On two undescribed Sponges and two* Esperiadæ *from the West Indies; also on the Nomenclature of the Calcisponge* Clathrina, *Gray*. By H. J. Carter, F.R.S. &c.

[Plate XVII.]

In Dr. Bowerbank's 'Monograph of the British Sponges,' published by the Ray Society in 1864, there are two illustrations of foreign sponges without names (viz. figs. 289 & 292, vol. i.), the former of which is stated to be "West Indian," and the locality of the other is not mentioned.

For these two sponges Dr. Gray, in his "Notes on the Arrangement of Sponges" generally, has proposed the names of *Ectyon sparsus* and *Acarnus innominatus* respectively (Proc. Zool. Soc. 1867, pp. 515 & 544).

There is, of course, little or no description of them amongst the British Spongiadæ, because they do not belong to the British Isles; but what little is stated of them is so contradictory, that it had better have been omitted altogether.

Thus, at p. 25, vol. i., the spicules of *Ectyon sparsus* are said to be "entirely" spined; at p. 125, "entirely and verticillately," and at p. 275, in the index to the figures, "verticillately," while in the figure itself (289) they agree only with the latter. Now all these are distinct terms for Dr. Bowerbank's different kinds of spined spicules, as may be seen in his "Terminology;" and had *Ectyon sparsus* any more than one form of spicule, the contradictions might have been of little consequence; but as there is only one form, they are most confusing and unsatisfactory.

Again, in *Acarnus innominatus* (fig. 292), there is only one kind of spicule recognizably figured, viz. the "recurvo-quaternate" form, and, but for the separate figures of this spicule given in figs. 73–76 inclusively, we should not know exactly what it was like; while there are no less than four others unfigured (equally distinct and beautiful forms) in this sponge, rendering it, above all others, the most exquisite little spicule-combination of any sponges with which I am acquainted.

Lastly, Dr. Bowerbank states of this sponge (fig. 292), in his "Terminology," that it is "a portion of the reticulated surface of the sponge," having called the preceding figure (fig. 291) *Hymeniacidon Cliftoni*. Thus "the sponge" would appear to mean *Hymeniacidon Cliftoni*; yet at p. 33, vol. i. it is stated to belong to his "Halichondroid tribe," which is much more intelligible, if not much more correct.

But Dr. Gray, who had nothing but Dr. Bowerbank's text and illustration for his guidance, evidently did not know all this, or he would not have placed this sponge, viz. *Acarnus innominatus*, amongst his Tethyadæ.

Under such circumstances I do not hesitate to give full illustrations and descriptions of both these sponges with Dr. Gray's names.

The former, which is a very large specimen (being nearly a foot long), is in the British Museum; and the latter, of comparatively insignificant size, had grown upon the fragment of calcareous débris (consisting of the remains of corals and the like) at its base. Hence, knowing that the former came from the West Indies (St. Vincent is suggested by Dr. Gray, who requested me to describe the specimen), we have also the locality of the latter, which Dr. Bowerbank has omitted, although, curiously enough, *Ectyon sparsus* and *Acarnus innominatus*

are figured by the latter close together, as if the author had obtained his knowledge of them from the same source as myself.

Beside *Acarnus innominatus*, there are the remains of two other sponges of the same family, which have grown together with it upon the fragment of débris mentioned, viz. two Esperiadæ, of which the spicular complements respectively (taken from minute portions) are also and only figured, but are sufficient to establish the species, although all other remains of the entire sponges have disappeared.

Then we do not expect to find these sponges in large masses, for it is not their habit, but rather with meagre development, although with exquisite combinations of spicules, to creep together over the small crevices of marine objects in the more shallow seas; and hence probably the term "*macilenta*" given by Dr. Bowerbank to one of them, which is also a British species.

Ectyon sparsus, Gray. Pl. XVII. figs. 1–3.

Kerataceous, massive, erect, compressed, sessile, tawny yellow or sponge-colour. Surface even, undulating; edges obtuse, round; free throughout, except at the point of attachment, which is contracted and sessile. Oscules of two kinds, viz. large and small, scattered generally all over the sponge (Pl. XVII. fig. 2); large oscules (*a a*) separate and single, small oscules (*b b*) frequently arranged in a petaloid manner. Pores situated in the minutely reticulated surface generally. Internally cavernous, canaliferous; canals tortuous, branched. Structure fibrous; fibre horny, round, reticulated and anastomosing, bearing spicules on its outer side only (fig. 1, *a a a*). Spicule of one form only, viz. acuate, slightly curved, verticillately spined at regular intervals throughout, except toward the point or free end, which is smooth (fig. 3, *a*, *b*); obtuse end a little smaller than the following portion of the shaft, covered with spines and sunk into the outer side of the fibre, which appears, under the microscope, to be hollow and rough or micropunctate (fig. 1). Spicule about 1-183rd of an inch long and 1-3000th of an inch in maximum width. Size of entire specimen 10 inches long, 5 inches high, and about 2 inches wide.

Hab. Marine.

Loc. West Indies.

Obs. This appears to be the specimen represented by Dr. Bowerbank in his fig. 289, which is stated to be a "West-Indian sponge." By Schmidt's mounted specimens at the British Museum, I see that it is his *Chalinopsis clathrodes*, which

comes from the coast of Caracas (Grundz. Spong. Faun. Atlant. Geb. 1870, p. 60); but no figured illustration of this is given. It is marked by Schmidt "*nova species*," yet appears to have been figured by Dr. Bowerbank in the 'Philosophical Transactions' of 1862 (pl. 30. fig. 7), and called *Ectyon sparsus* by Dr. Gray in 1867; so Schmidt's name of 1870 for this sponge is not wanted.

In Dr. Bowerbank's 'Monograph' it is given as a type specimen of his genus *Ophlitaspongia* (ὁπλίτης, *armed?*), wherein the spicules are confined to the external surface of the keratacous fibre, "exterspiculate" (externo-spiculate?), in contradistinction to the foregoing genus *Chalina*, where the spicules are *entirely* "interspiculate" (introspiculate?), illustrated in the type specimen *Chalina oculata*, fig. 262.

Nothing can be more natural or more distinct than these two characters for these two kinds of sponges respectively; yet, immediately after making the distinction, Dr. Bowerbank calls one of the commonest opalitous sponges on this coast (*Halichondria seriata*, Johnston) "*Chalina seriata*" (fig. 287), thus upsetting the ocular demonstration by untrustworthy mental reflection.

Schmidt, too, because the tricurvate or bow-like spicule is present in this sponge, would place it among his Desmacidinæ (Atlant. Spong. Faun. p. 76, note, & p. 77), when it would come, together with Dr. Gray's Esperiadæ, in his second subsection, viz. Spiculospongiæ, perhaps near *Dictyocylindrus* (p. 519, *l. c.*); but Dr. Gray has more properly put it with his Ophistospongiæ (Ophlitaspongia, Bk.), in his first subsection under the second order of Keratospongiæ, or horny sponges, with the name of *Seriatula seriata* (p. 515, *l. c.*). I say "more properly," because it is much more horny than spiculous or siliceous, which is the opposite to the Desmacidinæ.

Perhaps the most useful primary division of the Spongiadæ may be based on the rigidity or supporting-power of the skeleton-structure, *i. e.* in short, on the skeleton, thus:—

1. The rigidity of the skeleton dependent on a predominance of the sarcodal over the siliceous element. Commencing with *Verongia*, Bk., in which there is nothing but horny fibre.

2. The rigidity of the skeleton dependent on a predominance of the siliceous over the sarcodal element. *Ex. gr. Dactylocalyx pumiceus*, Stutchbury, in which the horny fibre is silicified.

3. The rigidity of the skeleton dependent on a predominance of the spiculous over the sarcodal element. *Ex. gr. Acarnus innominatus*, in which the sarcodal element is re-

duced to its minimum: *Hyalonema* &c.; also the Calcispongiæ.

Thus *Chalina seriata*, Bk., would come into the first division, viz. that in which there is more sarcodal or horny than siliceous development; and Schmidt's Desmacidinæ into the third division, the reverse, viz. that in which there is more spiculous than sarcodal or horny development.

Make, however, the presence of the tricurvate or bow-like spicule (for that is one of the spicules of *Chalina seriata*) supreme, and the division based on the rigidity of the skeleton breaks down altogether.

Schmidt, in his 'Note to the Synonymy of Dr. Bowerbank's Sponges' (*l. c.*), takes the presence of the tricurvate or bow-like spicule in *Hymeniacidon Bucklandi*, Bk., to be as accidental as it is peculiar to the Desmacidinæ; but I have shown that its existence in this sponge is normal—or at all events in *Dercitus niger*, which is but a variety of it (Annals, Jan. 1871), =*Pachastrella*, Sdt.; and Schmidt himself places the latter under his *Ancorinidæ*, that is, among the Pachytragian sponges (*op. cit.*).

So much for the value of a division based more on the presence of certain forms of spicule than on the rigidity of the skeleton, *i. e.*, in this instance, on the tricurvate or bow-like one.

Now *Chalina seriata* and the Desmacidine *Microciona atrosanguinea* are closely allied in form, habitat, and spicular composition, but in the way that *Ectyon sparsus* is allied to *Acarnus innominatus*, where, as may be seen by the illustrations, the rigidity of the skeleton in the former (Pl. XVII. fig. 1) depends as much on the keratified state of the sarcode as it does in the latter (fig. 4) on the number and arrangement of the large acuate spicules. Thus *Microciona atrosanguinea* bears to *Chalina seriata* (better *Seriatula*, Gray, for it is not a *Chalina*, if the latter be only *intro*-spicular) the same relation as *Acarnus innominatus* to *Ectyon sparsus*.

The specimen of *Ectyon sparsus* in the British Museum was evidently found on some strand, where it might have been washed about for years before it was picked up for further preservation—a way in which many foreign sponges are obtained, as there is not much time for deliberate dredging on the survey of a perhaps distant and perilous shore; and few beside naturalists care much for sponges beyond their intrinsic value.

Hence it is not surprising that the surface of this sponge, after having been exposed, perhaps, for months or years on a dry hot strand under a tropical sun, should present a greyish

or weather-worn white colour, while its interior still retains the tawny-yellow one which, in the living condition or fresh state, most probably pervaded it throughout.

Acarnus innominatus, Gray. Pl. XVII. figs. 4–6.

Spiculous, flat, spreading, sessile, penetrating and incrusting the interstices of bodies over which it grows, but not boring into them. Colour when fresh unknown, now light grey. Structure delicate. Surface even, isodictyal, presenting an irregularly hexagonal arrangement of the spicules (Pl. XVII. fig. 4). Oscules and pores not seen. Internal structure or skeleton polyhedral, subdivided, consisting of straight lines of spicules supported by delicate sarcode rendered more dense at the angles of union by the addition of the bulbous ends of capitate spicules &c., which project into the interstices (fig. 5). Spicules of five kinds, viz.:—(1) the largest, acuate smooth, slightly curved, and fusiform (fig. 6, *a*); (2) large capitate, shaft smooth, straight, provided with a globular inflation at the fixed end, and an inflated head at the free one, armed with four or five large recurved spines (*b*); (3) small capitate, the same, but much less in size, and the shaft sparsely armed also with recurved spines (*c*); (4) tricurvate, bow-like, robust, much arched (*d*); (5) equianchorate, three-fluked, minute (*e*,*f*). These spicules are respectively about 25-, 18-, 7-, 6- and 1-1800th of an inch long. The largest forms the meshes or skeleton of the polyhedral structure (figs. 4 & 5, *aaa*); and the rest are aggregated at the angles of union, whereby these points are rendered more dense and present a knotted appearance (figs. 4, *c c*, & 5). Size of largest specimen about an inch square, with variable thickness below 1-12th of an inch.

Hab. Marine.

Loc. West Indies.

Obs. This little sponge, apparently of an incrusting habit, humbly creeping over the débris of corals and the like (which, cemented together by calcareous material, appear, from the fragment still attached to *Ectyon sparsus*, to have formed the kind of rock on which the latter grew), presents, under the microscope, one of the most beautiful sponge-structures that I have ever seen. Each spicule has a most attractive form; and the whole produce a combination and arrangement (fig. 5) which, for exquisite beauty, individually as well as collectively, is, so far as my experience goes, unsurpassed, if not unequalled, among the Spongiadæ.

The hexagonal and isodictyal structure of the surface (fig. 4),

which closely resembles that of the Esperiadæ, together with the absence of horny fibre, a minimum of sarcode, and predominance of spicules, including tricurvate and anchorate ones, altogether claim for it a place in Dr. Gray's second subsection of Spicular Sponges, viz. his "Spiculospongiæ;" for here, contrary to the character of *Ectyon sparsus*, we have the spicular element developed at the expense of the sarcodal one, that is, an increase in the number of spicules and a reduction of the kerataceous fibre to a delicate sarcodal film.

The term "Halichondriæ" for this section of sponges is not near so expressive or intelligible, and therefore not near so well-chosen, as that of "Spiculospongiæ."

Thus *Acarnus innominatus* would come into Dr. Gray's second family, viz. "Esperiadæ;" and here I should be inclined to place it next to the genus *Microciona*, p. 535 (*l. c*), whereabouts it would probably have been placed by Dr. Gray himself, instead of among his Tethyadæ, had Dr. Bowerbank's figure been more detailed.

The anchorate spicule is precisely like that of *Microciona atrosanguinea*, Bk.; but the bow-like or tricurvate one is stouter and more arched. Again, the larger spicules of both are acuate; and although there is no isodictyal structure in *M. atrosanguinea*, from its peculiar mode of growth, the bulbous ends of many spicules of the latter, which are also globular, are sunk into the sarcode precisely in the same manner as the fixed ends of the capitate spicules in *Acarnus innominatus*. There are also in both species a few long spicules of hair-like fineness; but whether they are the earlier stages of the larger ones, or permanent forms, I have not been able to determine.

Microciona atrosanguinea, which is also one of the commonest sponges on this coast, is set down by Schmidt, in his 'Synonymy of Dr. Bowerbank's Sponges,' as a "Desmacidine," and hence would come under his family "Desmacidinæ," which, according to his "Sponge Pedigree" (Atlant. Spong. Faun. p. 83), are among the latest developments of his Protospongiæ, while the Ventriculitidæ are among the most ancient. Now the bihamate spicule is as characteristic of Schmidt's Desmacidinæ as the little siliceous ball is of his Geodinidæ; and both of these abound together fossilized in the "Upper Greensand" of Haldon Hill, in Devonshire (Annals, Feb. 1871, p. 112 &c.), while the Ventriculites as yet appear to have been found only in the Chalk, which is a subsequent formation. How this discrepancy, which makes the Ventriculitidæ the ancestors of the Desmacidinæ and Geodinidæ, is to be reconciled is left for the evolutionist to explain.

I have stated that the acuate spicules form the lines of the

isodictyal or polyhedral meshes of *Acarnus innominatus* (fig. 4, *a a a*), where from two to six are placed side by side and end to end for this purpose; and where they join, their ends are imbedded in a mass of sarcode densely charged with the minute anchorate spicules, amidst which are a considerable number of tricurvate or bow-like ones, all of which, united together, afford support to the bulbous ends of sometimes as many as twenty-four large capitate spicules, together with a few of the smaller capitate ones, which are not more than half the size of the former, and very sparsely scattered (fig. 5).

The capitate spicules are termed by Dr. Bowerbank "defensive," the anchorate "retentive," and the tricurvate or bow-like "tension spicula."

Among other offices, the former are supposed to be for catching "intruding worms" (p. 23), the anchorates for retaining the sarcode, and the latter to aid in expanding it.

How far such offices are imposed upon these spicules respectively in the present species the reader may conceive, where the capitate spicules are situated in cavities to which only the minutest particles are admitted, and the other spicules confined to the knots of the skeleton, where at least no tension whatever seems to be required; or how these purposes are fulfilled in sponges where there are no such spicules present, as in the Chalineæ, in which the spicules are *entirely* within the fibre, or in *Verongia*, where there are *no* spicules at all, he may also conjecture.

In short, it is only when the sponge is in a passive state, or dead or dried, that the ends of the spicules are uncovered by the sarcode. In the active living state, the sarcode invariably creeps up to the tops of them gradually, until the whole are concealed or thus invested. Hence the necessity of studying sponges generally in their active, living state, before attempting to assign uses to their different spicules, which under any circumstances are so self-evident in themselves, or so hidden altogether, or so indefinite, that to enter upon the subject savours more of weak twaddle than of useful description, and so perplexes the student, *usque ad nauseam*, that every moment he is inclined to throw away the book, exclaiming with the lawyers in court, "Give us your facts; we don't want your reasons."

The capitate spicules are present in all stages of development in *Acarnus innominatus*, as Dr. Bowerbank has well illustrated in his figures 73–76 inclusively.

From exposure and other causes, the specimens of this sponge had become more or less incrusted with calcareous material, which required to be dissolved off by an acid before

it could be well examined, when, from a white aspect, it assumed the grey colour above mentioned. In one part it had spread itself over the concavity of a small oyster-shell, but had in no part acted upon it after the manner of a *Cliona*.

Esperiadæ.

Beside *Acarnus innominatus*, two Esperiadæ had grown together with it, as above stated, one of which is *Hymeniacidon macilenta*, Bk. = *Carmia macilenta*, Gray (*l. c.* p. 537) = *Desmacidon*, Sdt. (*l. c.* p. 76), and the other apparently a new species, *Esperia socialis*, mihi.

They all belong to the same family, and present the same hexagonal or isodictyal aspect on the surface more strongly than any other sponge of this section,—growing for the most part, when in shallow water, with a creeping habit, insinuating themselves among the roots of *Laminaria digitata* and the like crevices in marine objects generally, but seldom spreading extensively unless in sheltered positions—or growing erect and branching, except in the shrubby *Esperia* of the deep sea.

The spicules of the West-Indian *Carmia macilenta* are much the same as those of the same species which grows on the south coast of Devon, viz. :—(1) acuate, fusiform, with oval defined head as wide as the thickest part of the shaft (Pl. XVII. fig. 8, *a*) ; (2) bihamate, large, robust, contort, elliptico-elongate (*c*) ; (3) inequianchorate, large, three-fluked (*a'*, *b*) ; (4) tricurvate, thin (*d*),—measuring respectively 22-, 6-, 3½-, and 2–3-1800ths of an inch long.

Beside these, there are a number of long, delicate, thin, acuate spicules, which, accompanied by small bihamates and anchorates, appear to be the early, if not aborted, stages in development of the larger spicules of the same kind and form respectively.

But if spicules are developed in this way, viz. from small to great, how is it that the central canal in some full-sized spicules is so large as to reduce their shafts almost to the thinness of mere shells or cases?

The only portion of this sponge found not being larger than a pin's head, there is not sufficient for a description of it generally. Its colour might have been "bright scarlet," as noticed by the Rev. A. M. Norman (*ap.* Bk.), or tawny yellow ; for it occurs of both colours here ; and this again presents another question, viz. in what states are sponges when they present these colours respectively, or does the scarlet colour indicate a reproductive one?

The spicular combination of *Esperia socialis*, mihi, which

was taken from a specimen equally small with the foregoing, consists of:—(1) acuate fusiform, with head less wide than the thickest part of the shaft (fig. 7, *a*); (2) bihamate contort, thin, almost semicircular (*c*); (3) inequianchorate, large, three-fluked (*a'*, *b*); (4) minute acuate in bundles (*d*); measuring respectively 35–40-, 3-, 4-, and 5-6-1800ths of an inch long.

The bihamates and minute acuate spicules in bundles occur together in masses in *Esperia socialis*. The latter, too (viz. the "bundles," which do not appear to be initiatory stages of the large spicules, but distinct developments, as I have only found them in three sponges), are not less characteristic of *Stelletta lactea* (Annals, Jan. 1871, pl. 4. fig. 22). I saw them also in the mounted specimen of *Esperia diaphana*, Sdt., from the Gulf of Florida, in the British Museum. Schmidt (*op. cit.* t. iv. fig. 13) gives the anchorate only, which is decidedly the largest on record, and in which he has been able to illustrate the course of the central canal.

Beside the spicules above mentioned, each specimen was pregnant with the usual rosettes found in the Esperiadæ, which, as those who have seen Dr. Bowerbank's excellent figure 297 (*l. c.*) already know, consist individually of an assemblage of the full-grown anchorates placed foot to foot in a radiating globular form. Here certainly the anchorates cannot be regarded as "retentive spicules," unless they are for carrying out bits of sarcode for reproductive purposes in the form of gemmules. We have yet to learn the office of these beautiful and ornamental little bodies.

With reference to the anchorates in detail, it will be observed that they have respectively three flukes or arms (figs. 7 & 8), that the two lateral ones are winged on to the shaft (*e e*), and that the central one is expanded into a petaloid form (*f*), supported inferiorly by a falcate web-like septum which connects the median line of the middle fluke with this end of the shaft (*g*). A similar condition exists in the foot (*h*); but here the alæ are united to the sides of the middle fluke, by which the space between the falcate septum and the alæ, on either side, is converted into holes like nostrils.

I allude to this more particularly, because, in the lateral view, it often appears as if the anchorate had but two flukes, whereby it has as often, under misconception, been termed "bidentate" (Bk. figs. 136 & 137, *l. c.*); indeed in these two figures there are, to me, evidently three flukes; and, further, I much question, if every kind of anchorate were minutely examined on all sides or in all directions, whether any would

be found to be only "bidentate"—that is, whether in all more or less of a central fluke might not be detected.

It is worthy of remark, when looking at the illustrations of *Ectyon sparsus* and *Acarnus innominatus* in the plate, that, although belonging to different orders, both are armed sponges—that is, characterized by the projection of spicules from the outside of the skeleton into the interstices; while the skeleton of *Ectyon sparsus* is formed of horny fibre, and that of *Acarnus innominatus* of large spicules almost alone respectively, showing the value of the latter distinctions over the former similarity, in the matter of classification.

On the Nomenclature of Clathrina, Gray.

As regards the multiplication of synonyms, which is the bane of natural history, Dr. Bowerbank has chosen new names for nearly all Dr. Johnston's sponges, Dr. O. Schmidt new ones for almost all Dr. Bowerbank's, and my friend Dr. Gray new ones for the species of both.

Much of this has arisen from the want of adequate illustrations of the entire sponges, in the first place, combined with microscopical details—an omission which characterizes in part Dr. Johnston's work of 1842, where the absence of the latter is more excusable, because the value of the microscope in such inquiries had hardly become known when his book was under preparation, but certainly not in Dr. Bowerbank's 'Monograph' of 1864–66, wherein both illustrations and details are wanting—a deficiency which Dr. Bowerbank informs me he is about to supply; but, unfortunately, the time is past, the names are multiplied, and Dr. O. Schmidt's works on the Sponges of the Adriatic Sea, the coast of Algiers, and the Atlantic Ocean have deservedly become the chief sources of reference for those engaged in the study of the Spongiadæ.

There is a calcisponge which grows in flat spreading patches over the lower surfaces of the rocks here as plentifully as, if not more so than, any other kind or species. At first it looks like a delicate piece of fine white lace; but on nearer inspection, especially with a lens, it may be observed to consist of a dense reticulation of anastomosing tubular thread, which finds its vents on the summits of small papillary eminences of the same structure, from which the tubulation, a little increased in size at these points, branches off to the divisions of the sponge which the vents or oscules respectively drain.

For this sponge Montagu, in 1818 (Mem. Werner. Soc. vol. ii. p. 116), proposed the name of *Spongia coriacea*, with the following description:—"The fibres that constitute this

sponge are composed of very fine spicula, and are intersected with numerous large pores and cavities, giving the appearance of singed leather or a piece of dark-coloured worm-eaten wood in a very decayed state. One side is rather smooth, with circular depressions or cavities. The only specimen that has occurred is depressed, four inches in length and above two in breadth." These are his words (*ap.* Johnston). "Depressed" cannot apply to Dr. Bowerbank's *Raphyrus Griffithsii*, as suggested by this author (p. 36, *l. c.*); for the latter, from its structure and mode of growth, must, when of the dimensions mentioned, be more or less thick or elevated; while the calcisponge must, from *its* structure and mode of growth, be equally more or less thin or depressed. Besides, we have only to turn to Johnston (p. 124) to see that *Raphyrus Griffithsii* is no new genus at all, but a free form of *Cliona* (*Halichondria*, Johnst.) *celata*, which Montagu seems to have had in view "when he drew up the description of his *Spongia fava*." Both the calcisponge and the *Cliona* (*Raphyrus Griffithsii*) occur here in great abundance, the former, as above stated, on the rocks, and the latter in masses larger than the fist, which, drifting about in the sea (perhaps after having destroyed the oyster-shells in which they commenced their existence), are cast ashore in great quantity during heavy gales of wind from the south. I am therefore able to state, from personal observation, that Montagu's *Spongia coriacea* was intended for the calcisponge, and not for the *Cliona*.

In 1842, Johnston gave a figure and description of this calcisponge under the name of *Grantia coriacea* (*op. cit.* p. 183); in 1864 it appears in Dr. Bowerbank's 'Monograph' (vol. ii. p. 34) with the name of *Leucosolenia coriacea*; in 1864 it is also figured and described by Schmidt (Supp. Adriat. Spong. p. 24, t. iii. fig. 3) under the name of *Grantia clathrus*; and, lastly, in 1867, Dr. Gray (Proc. Zool. Soc. p. 557) has called it *Clathrina sulphurea*, which, wisely and fortunately, has been adopted by Häckel in his "Prodromus" (Annals, March 1870, vol. v. p. 183). Dr. Gray very properly made it the type of a distinct genus, which Häckel has accepted.

A few specimens of this sponge were dredged up from about 20 fathoms by Schmidt, in the Adriatic Sea; but they were not good ones, as his figure and description testify. "Oscula in summitate ramusculorum brevium" does not exactly apply to this sponge as I have above described it; nor does the meagreness of Schmidt's figure of a dredged specimen, as might be expected, accord with the more or less expanded, circular, and circumscribed patches of continuous dense network in which this sponge presents itself in full and robust

development on the under surfaces of rocks here which are left uncovered by the tide for several hours daily.

The central and oldest portion, too, very frequently becomes elongated, from its pendent position, into a mammiform process as large as the top of a man's thumb, which appears to be more or less effete (exhausted in the middle, like some spreading fungi), while the circumferential parts are the best developed for description, and are most likely to die with their vents or oscules open—a contingency which has led previous describers occasionally to pass them over unobserved.

From the papillary eminences where the oscules are situated the tubulation branches off in all directions, anastomosing with that which belongs to the neighbouring divisions, and thus forming a continuous network drained by the several oscules, just as the canal-system in the solid sponges.

Here, then, the only difference between the network of *Clathrina* and that of the solid sponges appears to be the absence of the interstitial matter which, uniting the branches of the canal-system together in the latter, gives them their solidity. Thus it would appear that the canal-system in both does not end in open mouths anywhere except at the oscules, and that whatever gets into it must naturally pass through the pores and be very minute, as their capillary extremities only end in anastomoses. In this way probably we may picture to ourselves the excretory canal-system of *all* sponges.

Of the colour, too, of this sponge there would appear to be a difference of opinion : thus Schmidt's specimens were sulphur-yellow, Lieberkühn's (*ap.* Sdt.) colourless, Mrs. Buckland's (*ap.* Bk.) crimson, Johnston's bluish grey or white changing to yellowish brown when dried or immersed in fresh water—which latter is a very good test for the species, as will presently be shown.

The specimens here are whitish or bluish grey, with occasionally sulphur-yellow, but with no structural difference that I can detect; so I conclude that both colours belong to the same species. I have never seen it of a crimson colour; but, as I have before stated respecting the bright scarlet colour of *Esperia macilenta*, it would be worth inquiring whether these bright colours occasionally assumed by sponges have not something to do with the reproductive process.

We must not forget, however, that in some instances the colour may be owing to the presence of a foreign organism or parasite.

Thus I have just observed, in a portion of *Halichondria incrustans* found here last September, growing on the rocks, that, although generally of its natural or yellowish sponge-

colour, the tips of the surface are deep carmine-red; and this is owing to the presence of a parasitic cell, of a beautiful carmine colour, which, bound together in great numbers by a transparent envelope, pervades the whole of the sponge in little prothalloid masses, appearing here and there on the surface in minute botryoidal tubercles of a dark black-brown colour, formed of a congeries of radiating columns of brown cells placed one above the other in their tubular envelopes respectively, the carmine ones on one side in the sponge giving rise to the brown ones in the columns of the botryoidal tubercle on the other.

This looks very much like a *Hildenbrandtia* of the fresh-water kind, which I described and figured in 1864 (Journal of Botany, No. xx. p. 225), and which, indeed, is no *Hildenbrandtia* at all, but the type of a new genus, if Kützing's diagnosis of the fructification of the latter is to be the criterion (Sp. Alg. p. 694); for the conceptacle contains neither tetraspores nor paraphyses.

But, without knowing the import of the botryoidal masses, or whether there is any further development of this organism, I am unable at present to do more than state what I have seen of it, for the guidance of others.

The cell, while in its prothalloid investments in the body of the sponge, is about 1-4000th of an inch in diameter, subcircular, capsular, filled with homogeneous plasma of a beautiful pink or carmine colour by transmitted light, growing granular toward the surface, where, from a total absence of definite arrangement in the prothalloid carmine mass, it developes a defined column of cells filled with plasma of a yellowish-brown colour by transmitted light, which, placed together collectively in a radiating form, produces the dark botryoidal tubercles on the surface, varying in diameter below the 1-48th of an inch.

Undoubtedly this is a true Algal (?) parasite of *Halichondria incrustans*, which, perhaps, may account for the colour of the specimen sent to Dr. Bowerbank by Mrs. Griffith, and marked as having been "scarlet, but not fœtid" (Brit. Spong. vol. ii. p. 251). Be this as it may, it seems to be the first instance on record, and as yet only seen in *Halichondria incrustans*.

There is one phenomenon about *Clathrina* which is very characteristic of the species, and has been alluded to by Dr. Johnston, as just quoted, in such a way that it shows that he must have studied the sponge in its living state, unless informed of the fact by others,—viz. that when it dies or is put into fresh water, the white colour immediately changes (that

is, *here*) to ferruginous or brick-red, which, when the specimen is dried, turns again to yellowish brown. And this is the more striking when it has grown together with *Grantia nivea*, which retains its white colour throughout.

So much for the nomenclature and history of this beautiful calcisponge, finally, I hope, and most appropriately, called "*Clathrina*." May its synonyms rest here; for so evidently self-strangling must this course, if continued, be in the end to natural history, that, on naming an object, one may be pardoned for recalling to mind the following lines in Shakspeare's epitaph :—

> "Blest be the man that spares these stones,
> And cursed be he that moves my bones."

Then, again, we are not all Shakspeares.

EXPLANATION OF PLATE XVII.

Fig. 1. *Ectyon sparsus*, Gray: fragment much magnified, to show :—*a a a a*, horny fibre; *a' a' a'*, portion of the same, deeper; *b*, spicules situated on the outside of the fibre; *c*, fixed ends of the spicules from which the rest of the shaft has been broken off. Scale 1-12th to 1-1800th of an inch.

Fig. 2. The same, portion of surface, to show the two kinds of oscules, viz. large and small: *a*, large oscules: *b*, smaller oscules arranged more or less in a petaloid manner. Natural size.

Fig. 3. The same: *a*, spicule much magnified; *b*, section of the same, near its base. Scale 1-12th to 1-6000th of an inch.

Fig. 4. *Acarnus innominatus*, Gray; diagram of fragment of surface, to show its irregular hexagonal structure: *a a a*, straight lines indicating the bundles of acuate spicules which form the polyhedral structure of the skeleton; *a'*, central heptagon, from actual measurement; *b b b*, capitate spicules projecting into the interstices; *c c*, knots or angles of union of the acuate spicules thickened by the presence of sarcode densely charged with the anchorate and other spicules figured hereafter. Scale 1-48th to 1-1800th of an inch.

Fig. 5. The same, knot or angle of union of the acuate spicules, more magnified: *a a a a*, acuate or skeleton-spicules forming the heptahedral structure; *b b b b*, large capitate spicules projecting into the interstices; *c c c*, small spined ones, also projecting into the interstices; *d d d*, tricurvate or bow-like spicules confined to the sarcode of the knots; *e e e*, equianchorate spicules, with which the sarcode of the knots is densely charged. Scale 1-12th to 1-1800th of an inch.

Fig. 6. The same, specimen of each of the spicules, still more magnified: *a*, acuate or skeleton-spicule, smooth, slightly curved; *b*, large capitate spicule, smooth, straight shaft, with head 4-spined, recurved, sometimes 5-spined (see fig. 5, *f f*); *c*, small capitate spicule, shaft straight, sparsely spined, spines recurved; *d*, tricurvate or bow-like spicule; *e*, equianchorate spicule, anterior view; *f*, lateral view. Scale 1-12th to 1-6000th of an inch.

Fig. 7. *Esperia socialis*, mihi: *a*, inflated end of acuate or large skeleton-spicule; *a'*, front view of anchorate spicule; *b*, lateral view of the same; *c*, bihamate spicule; *d*, bundle of minute acuate spicules (the two latter occurring in masses together); *e e*, lateral flukes; *f*, middle fluke; *g*, falcate septum; *h*, foot. Scale 1-12th to 1-6000th of an inch.

Fig. 8. *Carmia macilenta*, Gray: *a*, inflated end of acuate or large skeleton-spicule; *b*, front view of anchorate spicule; *a'*, lateral view of the same; *c*, bihamate spicule; *d*, tricurvate spicule; *e e*, lateral flukes; *f*, middle fluke; *g*, falcate septum; *h*, foot. Scale 1-12th to 1-6000th of an inch.

XXXVI.—*On the Claspers of Male Lizards* (Sauri).

By Dr. J. E. Gray, F.R.S. &c.

My attention has been drawn to this subject by the following circumstance:—

Mr. F. Moore, of the India Museum, has sent me a specimen to ask me if I can give him a clue to what it really is; it was sent, with some *botanical* products, from Bombay, where he believes it is used as an article of food; and "it has hitherto been supposed to be the root of a plant (*Cyclamen*), which of course it is not." Others have determined it to be a *Holothuria* or something of the kind, or a particular form of barnacle.

When it was soaked in hot water, so as to expand it, there was no doubt about its being part of an animal; and I was inclined to regard it as the penis of a lizard, from what I recollected of the form of that organ; and I was sure that it was part of a reptile, on account of the group of scales with which the base was covered.

But when I cut it open, I found that it was quite solid, and without any opening in any part of its surface for the emission of any secretion, and consisted of a pair of parallel cartilages covered with a skinny sheath, covered externally with horny plates, and having at the end a pair of exposed horny processes, which are divided at the end into several acute prominences, very unlike the structure of a penis.

On my showing the specimen to Dr. Günther and Mr. Edward Gerrard, they both determined that it was the penis of a lizard; and, at my request, Dr. Günther confirmed this determination by showing me the retracted penis of a Monitor preserved in spirits; and Mr. Gerrard showed me a stuffed specimen of *Varanus heraldicus* in the Museum, in which the penes were exserted; and there could be no doubt that we had rightly determined the true nature of the bodies which Mr. Moore had submitted to my inspection.